

### **REMARKS**

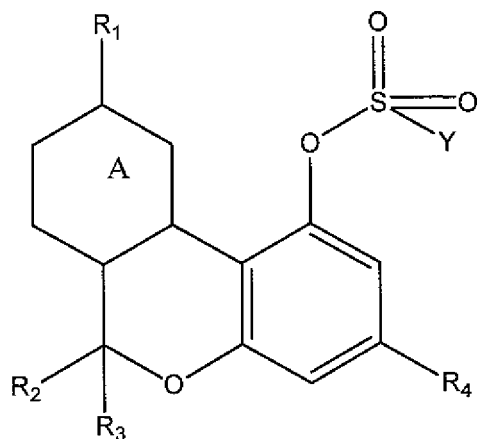
Claims 1 and 3-23 are presently pending in this application. The Applicants respectfully request that claims 6-7, 16-17, and 22-23 be cancelled. Furthermore, Applicants respectfully request that claims 1, 3, 10, and 18 be amended as shown above. Support for these amendments may be found on at least pages 3-5. No new matter has been added by these amendments.

#### **Response to 35 USC §102(b) rejection**

Reconsideration is respectfully requested of the rejection of claim 1 under 35 U.S.C. 102(b) in view of Cahn; claims 3, 10, 13, and 14 under 35 U.S.C. 102(b) in view of Melikian; and claims 3-5, 10, 13-15, and 18-20 under 35 U.S.C. 102(b) in view of Fahrenholtz.

#### **Claim 1 is novel in view of Cahn**

Claim 1 as amended is directed to cannabinoid esters as represented by formula A



Formula A

wherein R<sub>1</sub>, R<sub>2</sub>, R<sub>3</sub>, and R<sub>4</sub> are H or an alkyl; A is a saturated alkane, alkene, or diene; and Y is

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an aryl selected from the group consisting of benzene, alkyl substituted benzene, halogen substituted benzene, and alkyloxy substituted benzene.

Cahn discloses only cannabinol compounds, wherein A is an aromatic ring. Claim 1 has been amended to overcome this rejection by removing 'aromatic ring' as a choice for A. As a result, Cahn does not disclose the Applicant's cannabinoid compounds; therefore claim 1 cannot be anticipated by Cahn. Withdrawal of this rejection is therefore requested.

It is noted that the amendment to claim 1, limiting the claimed novel compounds, is in no way intended to limit the method claims. While certain structures included in the original claim 1 may not be novel, there has been no disclosure that counters our assertion that the method of making, method of purification, or the production of compounds that are stable crystals at room temperature under air are novel.

**Claims 3, 10, 13, and 14 are novel in view of Melikian et al**

The rejection of Claims 3, 10, 13 and 14 under 35 U.S.C. 102 (b) as being anticipated by Melikian et al is respectfully traversed as teaching applicants method.

Claim 3 as amended is directed to a process for the preparation of cannabinoid aryl sulfonates comprising reacting at least one cannabinoid with at least one aryl sulfonyl halide in the presence of at least one base  $R_5R_6R_7N$ , wherein  $R_5$ ,  $R_6$  and  $R_7$  are lower alkyls of 1 to about 6 carbon atoms, and a solvent, wherein the cannabinoid aryl sulfonates are crystalline and stable at room temperature under air.

Claim 10 as amended is directed to a process for the purification of a cannabinoid comprising esterifying the cannabinoid with at least one aryl sulfonyl halide in the presence of at least one

base  $R_5R_6R_7N$ , wherein  $R_5$ ,  $R_6$  and  $R_7$  are lower alkyls of 1 to about 6 carbon atoms, to form a cannabinoid aryl sulfonate; and allowing the cannabinoid aryl sulfonate to crystallize, wherein the cannabinoid aryl sulfonate is crystalline and stable at room temperature under air.

Contrastingly, Melikian discloses dansyl substituted compounds that are in the form of an oil. Independent claims 3 and 10 have been amended to more clearly define that the compounds formed by the present invention are crystalline and stable at room temperature under air. As Melikian does not disclose this aspect of the claim, it cannot anticipate Applicants invention.

Additionally, nowhere does Melikian disclose or suggest the purification of a cannabinoid aryl sulfonate comprising esterifying the cannabinoid with at least one aryl sulfonyl halide in the presence of at least one base to form a cannabinoid aryl sulfonate; and allowing the cannabinoid aryl sulfonate to crystallize and become stable at room temperature under air as required in claim 10. Because Melikian fails to disclose every element of claims 3 and 10, it cannot anticipate. As a result, claims 3 and 10 are novel in view of Melikian. Furthermore, claims 13 and 14 which depend from claim 10, and are likewise patentable over Melikian.

**Claims 3-5, 10, 13-15, and 18-20 are novel in view of Fahrenholtz**

The rejection of claims 3, 4, 5, 10, 13, 14, 15 and 18-20 under 35 U.S.C. 102 (b) as being anticipated by Farenheit ((sic) the inventor is Fahrenholtz) U.S. Patent No. 3,636,058 is respectfully traversed. For a reference to anticipate, it must teach every aspect in the claim. The independent claims 3, 10 and 18 have been amended to require that the base used is a tertiary alkyl amine. As stated by the Examiner, Fahrenholtz teaches the use of pyridine, not a tertiary alkyl amine of the formula  $R_5R_6R_7N$ , wherein  $R_5$ ,  $R_6$  and  $R_7$  are lower alkyls of 1 to about 6

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carbon atoms. For this reason Fahrenholtz cannot anticipate the Applicants invention and withdrawal of this rejection is therefore respectfully requested.

### **Response to 35 USC §103 rejections**

The rejection of claim 1 under 35 U.S.C. 103(a) as being unpatentable over Clearly is respectfully traversed. Note: It is assumed this rejection is over Cahn, not Clearly. If this assumption is incorrect, Applicant's representative requests a corrected Office Action and additional time to respond to this rejection.

Claim 1 has been amended to overcome Cahn. The Examiner states it is obvious to form aryl sulfonates of the cannabinol type compounds disclosed in Cahn. Even if this statement is true, claim 1 as amended does not claim cannabinol compounds, moreover, applicant has clearly excluded cannabinol by the amendment herein. There is no teaching, disclosure or suggestion of the cannabinoid compounds claimed by the Applicant. Therefore withdrawal of this rejection is respectfully requested.

The rejection of claims 3-23 under 35 U.S.C. 103(a) as being unpatentable over Fahrenholtz is respectfully traversed. The Fahrenholtz patent discloses what is now considered a conventional method of purifying cannabinoids, well known in the art as the Fahrenholtz method. The Fahrenholtz synthetic method results in a mixture of cannabinoids including delta-8-tetrahydrocannabinol, delta-9-tetrahydrocannabinol, and further unknown impurities. Thus, the esterification of delta-9-THC with m-nitrobenzenesulfonyl chloride and the crystallization of delta-9-THC are likely affected by the presence of the delta-8-THC and the unknown impurities.

There is no teaching, disclosure or suggestion of the formation of Applicant's claimed storage stable crystals.

The present invention relates to a purification method of a mixture of cannabinoids from natural or synthetic methods of manufacture by forming storage stable cannabinoid aryl sulfonates. The sulfonates are formed by reacting at least one cannabinoid with at least one aryl sulfonyl halide in the presence of at least one tertiary alkyl amine in a solvent. Fahrenholtz does not disclose the Applicant's use of a tertiary alkyl amine in a solvent. It is further submitted that this modification is not obvious. The Examiner has stated that one could use pyridine as both the base and the solvent. This is not supported by the Applicant's disclosure, since it is disclosed in Example 1, that after the base is reacted, the solvent and base are separated by washing.

Further, these modifications of method and reagents are not insignificant. The method of the present invention is more efficient and economical than the Fahrenholtz purification in that the present invention also provides a purer product in a much higher yield with less expensive reagents than the Fahrenholtz purification method. In Fahrenholtz, the synthetic method results in a mixture of olefins containing 74% delta-9-THC and 26% delta-8-THC. The mixture of olefins is treated with m-nitrobenzenesulfonyl chloride in dry pyridine to obtain a 23% yield of the cannabinoid sulfonate (delta-9-THC m-nitrobenzenesulfonate). In the present invention, however, a different mixture of cannabinoids (i.e. not exclusively or necessarily delta-8-THC and delta-9-THC) are purified by first esterifying the cannabinoid mixture with a sulfonyl halide in a base with an organic solvent to provide a much higher yield of cannabinoid derivative. For example, in one embodiment of the present invention, the cannabinoid mixture is treated with p-toluene sulfonyl chloride, triethyl amine and toluene to obtain a 74% yield of THC tosylate

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(delta-9-THC-4-methylbenzene sulfonate). Applicant's present invention overcomes the limitations of the Fahrenholtz method by forming and claiming storage stable derivatives and providing significantly higher yields. Withdrawal of this rejection is therefore respectfully requested.

### **Response to 35 USC §112 rejection**

The rejection of Claim 1 under 35 U.S.C. 112, second paragraph, is respectfully traversed. The Examiner writes that since A is a ring, it cannot be an alkane, alkene or diene. It is noted that when A is cyclohexane, A is an alkane; when A is cyclohexene, A is an alkene; and when A is cyclohexadiene, A is a diene. Withdrawal of this rejection is respectfully requested.

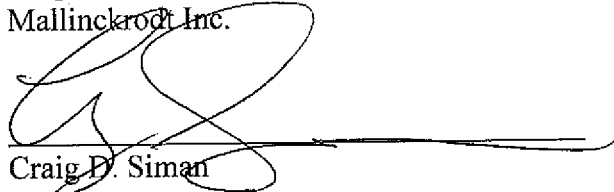
As none of the references cited by the Examiner, individually or in combination, teach, disclose or suggest a stable crystalline cannabinoid aryl sulfonate compound, allowance of this application is respectfully requested.

If any issue regarding the allowability of any of the pending claims in the present application could be readily resolved, or if other action could be taken to further advance this application, or if the Examiner should have any questions regarding the present amendment, it is respectfully requested that the Examiner please telephone Applicant's undersigned attorney in this regard.

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Date: 20-Sep-2007

Respectfully submitted,  
Mallinckrodt Inc.

A handwritten signature in black ink, appearing to read "Craig D. Siman", is written over a horizontal line. The signature is stylized with a large loop and a long horizontal stroke extending to the right.

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